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MEETING OF AMERICAN PHYSICAL SOCIETY

The 234th regular meeting of the American Physical Society was held in Washington on April 25, 26, and 27, with two sessions at the Bureau and one at the National Academy of Sciences. The following papers reported work by members of the Bureau's staff:

New X-ray laboratory of the National Bureau of Standards. Lauriston S. Taylor. The laboratory building has just been completed, and the paper described the equipment, which includes a 1,400,000-volt generator, two X-ray tubes, measuring and protective devices, a half-wave rectifier set for use with liquid ionization measurements, and a 180,000-volt d-c set for low-power exploratory work.

Critical phenomena. E. F. Mueller, Edward O. Sperling, and D. C. Ginnings. This paper described an apparatus designed to exhibit particularly the large changes in density occurring below the critical temperature in both liquid and vapor.

Quartz double monochromator with single wavelength control. F. S. Brackett, H. T. Wensel, and J. B. H. Kuper. The construction and operation of this quartz double monochromator, which provides a single control for all wavelength adjustments, yielding critical definition from 7000 to 2000 A, were briefly described.

The electromotive force of saturated Weston standard cells containing D_2O. Langhorne H. Brickwedde and George W. Vinal. Weston saturated standard cells containing up to 98 mole percent of "heavy water" have been made. The emf was found to decrease with increasing D_2O content, while the temperature coefficient between 17° and 28° C is independent of the D_2O content.

Recombination and electron attachment in the F_2 layer of the ionosphere. Fred L. Mohler. The conventional theory of the ionosphere, which assumes that electrons are produced by photoionization and that they disappear by pure recombination, is shown not to be borne out by observa-

[1] Published with approval of the Director of the Budget.

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tions on the highest layer. These indicate that electrons in the F_2 layer disappear also by negative ion formation, so that the apparent recombination coefficient decreases with the pressure. A possible explanation was given.

While at the Bureau, many of the members and guests took advantage of the opportunity to inspect the new high-voltage laboratory. The large transformer bay in this building is 132 by 65 ft in floor plan with a height of 60 ft. In addition, there are five laboratory floors 30 ft wide and 132 ft long. Present plans call for an approximately equal division of space between high-voltage electrical measurements and X-ray investigations.

THIRTIETH NATIONAL CONFERENCE ON WEIGHTS AND MEASURES

The thirtieth National Conference on Weights and Measures will be held in Washington on June 4 to 7, inclusive, with sessions at the Bureau and at the Mayflower Hotel. Two new committees—on legislation and on publicity and education—will report to the Conference for the first time. Because of the sudden death of F. S. Holbrook, for many years secretary of the Conference, the election of a new secretary will be necessary.

A cordial invitation to attend the sessions is extended by Dr. Lyman J. Briggs, President of the Conference, to all those interested in any phase of weights and measures administration.

HENRY W. BEARCE HEADS DIVISION OF WEIGHTS AND MEASURES

Dr. Lyman J. Briggs, Director of the Bureau, has announced the appointment of Henry W. Bearce as chief of the Division of Weights and Measures. Since the death of Major Louis A. Fischer in 1921, Mr. Bearce has served as cochief of the division with F. S. Holbrook, who died suddenly on February 4, 1940 (Technical News Bulletin 275 (March 1940)).

Ralph W. Smith has been appointed assistant chief of the Division. Mr. Smith, who has headed the section on weights and measures laws and administration for many years, will continue his close relations with State and local weights and measures officials, and will direct the Bureau's surveys of large-capacity scales.

SAFETY RULES FOR INSTALLATION AND MAINTENANCE OF ELECTRIC UTILIZATION EQUIPMENT

Handbook H33, which is now available in printed form, consists of part 3 of the National Electrical Safety Code dealing with utilization equipment and the grounding rules contained in section 9. The detailed rules deal with conductors and protective devices used in the interior wiring of buildings and also with the control equipment, including switchboards and panel boards. Separate sections are devoted to various applications, such as motors and motor-driven machinery, electric furnaces, lighting fixtures, portable appliances, etc. A section is also included on telephone and other communication apparatus. The requirements for grounding and the methods of making grounding conections are dealt with in detail.

Copies of H33 are sold by the Superintendent of Documents, Government Printing Office, Washington, D. C., at 15 cents each.

LOAD-CARRYING CAPACITY OF JOURNAL BEARINGS

In the May Journal of Research (RP1295), S. A. McKEE describes a method for the application of friction and heat-dissipation data to the determination of the load-carrying capacity of a journal bearing when operating with a lubricant of known characteristics. The method is also used to estimate the effects of changes in a number of factors upon the operating characteristics of the bearing. The application of the method as a means for estimating the load-carrying capacity of bearings in actual service is outlined for the case of automotive engine bearings.

MACHINE FOR TESTING BRAKE LINING

The Bureau has installed a new inertia-type machine for testing brake lining, designed by Rolla H. Taylor and William L. Holt, with the advice and cooperation of members of the Brake Lining Manufacturing Association. Although smaller, it is similar in operation to machines used in the industry. A heavy flywheel is brought up to the desired speed, the power is then shut off and the flywheel stopped by means of a brake mechanism which employs the

lining under test. The energy absorbed per square inch of lining in stopping the flywheel is comparable to the energy absorbed in stopping an automobile. Tests of brake lining include two types of measurements: (1) Determination of the coefficient of friction of the lining under various conditions, such as when the lining is hot or cold, wet or dry; and, (2) determination of the rate of wear.

A desirable brake lining is one in which the coefficient of friction remains reasonably constant regardless of service conditions and in which the rate of wear is low. For the best operation, different types of brakes require linings with different friction characteristics.

An article in the Journal of Research for May (RP1297) contains a complete description of this machine.

NEW RATE OF FLOW METER FOR VARIABLE DISCHARGES

A new rate of flow meter recently completed in the Bureau's shops and installed in the hydraulics laboratory makes it possible to measure accurately the variable discharge rates characteristic of certain types of plumbing fixtures.

The function of this device is to catch the discharge water from a plumbing fixture in several successive compartments, the motion of which beneath the discharge nozzle is accurately timed. To accomplish this, the meter is built with a rotating annular container, or bucket, 50½ inches in outside diameter, 2 feet high, and divided into 60 equal segmented compartments. This container is mounted on a vertical shaft which is driven, through a variable speed transmission, by an electric motor. Any speed up to 6 rpm can be secured.

In a test, the total time consumed in a discharge is noted, and the speed of the meter is so adjusted that a trifle less than one complete revolution is accomplished in this time. Then, as the plumbing fixture discharges, the annular container rotates and catches an amount of water in each compartment exactly proportional to the rate of discharge during the very brief interval of time that the compartment was under the discharge nozzle.

The water in the compartments is then drawn off through stopcocks into glass graduates, where the volume is accurately determined. These results, when plotted against time, give a curve which shows every variation in the discharge of the fixture.

At present, the meter is being used in the cooperative investigation of flows in plumbing systems, sponsored by the Plumbing Fixture Manufacturers Research Association and the Bureau. Already some unsuspected peculiarities in discharge rates have been discovered.

SIMPLIFIED CURL TESTER FOR PAPER

The curling of paper often causes trouble in printing processes and in other industrial uses of paper. Curling is caused by a differential expansion of the two sides of the sheet when the atmospheric conditions change. An instrument, known as the curl sizing tester, designed by F. T. Carson and Vernon Worthington has been used for some time at the Bureau to measure the rate of penetration of water and the angle through which a paper curls when wet on one side. Recently, this apparatus has been simplified in its application to the latter purpose. The testing device is an aluminum float provided with a wetting aperture, a specimen holder, and a scale laid off in degrees. The maximum angle of curl for a given width of aperture affords a measure of the relative curling tendency. Such data correlate satisfactorily with the likelihood of curling trouble that one may expect in the use of various papers.

REDETERMINATION OF MUNSON-WALKER REDUCING SUGAR VALUES

Lester D. Hammond has determined reducing sugar values for a new mixture of sucrose and invert sugar containing 0.3 g of total sugar, in order that a sample of a new sugar product of a high content of invert sugar can be weighed directly in such manner as to fall within the limits of the method of Munson and Walker. The conditions of this method were rigorously followed, but the copper was determined electrolytically instead of weighing it directly as cuprous oxide. Also, the Munson-Walker values were redetermined, and corresponding values for levulose were determined. An extensive table of reducing sugar values for dextrose, levulose, invert sugar, and for

sucrose and invert sugar mixtures containing 0.3, 0.4, and 2.0 g of total sugar has been computed.

The complete report of this redetermination will be published as RP1301 in the May number of the Journal of Research.

ISOLATION OF HYDROCARBONS FROM PETROLEUM

The aromatic-free fraction of a mid-continent petroleum boiling between 90° and 92° C was substantially resolved into its constituent hydrocarbons, and the work is reported in RP1296 by Augustus R. Glascow, Jr., in the May Journal of Research. Alternation of atmospheric distillation and azeotropic distillation with methyl alcohol separated the material boiling between 90° and 91.2° C into a concentrate of 2-methylhexane and a naphthenic concentrate. From the naphthenic concentrate, *trans*-1,3-dimethylcyclopentane was isolated by crystallization from liquid ethane. A similar procedure separated the material boiling between 91.2° and 92° C into a naphethenic and a paraffinic concentrate. From the naphthenic concentrate, *trans*-1,2-dimethylcyclopentane was isolated by crystallization from liquid propane plus methane. From the paraffinic concentrate, 3-methylhexane was obtained in the residue from distillations at reduced pressure (215 mm Hg). The physical properties of the isolated hydrocarbons and an estimate of their relative amounts in the original petroleum are given.

PHOTOCHEMISTRY OF SHEET MATERIALS

In RP1300 in the Journal of Research for May, Herbert F. Launer shows that destructively high temperatures are attained by sheet materials under the usual conditions of irradiation by the electric arc, such as in "weathering" and "light" stability tests. It is therefore evident that temperatures must be controlled if photochemical effects, as contrasted with heat effects, are to be observed. An apparatus has been developed at the Bureau for the close control of temperature during irradiation of sheet materials, such as paper, cellulose acetate, rubber, etc., by bringing them into intimate contact with a thermostated metal backing by means of air pressure, and by removal of most of the infrared radiant energy. Arrangements are described for controlling the moisture and oxygen content, from normal to very low values, of the atmosphere around the samples during irradiation. Data are given showing the effectiveness of the various parts of the apparatus.

PECTIC SUBSTANCE IN COTTON AND ITS RELATION TO THE PROPERTIES OF THE FIBER

In a paper by Roy L. Whistler, A. R. Martin, and Milton Harris, of the research associateship of the Textile Foundation, in the May number of the Journal of Research (RP1299), evidence is presented which indicates that a pectin-cellulose compound does not exist in native cotton fibers and that the pectic substance is present as an insoluble salt of polyvalent ions. Replacement of these ions by sodium or ammonium renders the pectic substance soluble. Cotton freed of pectic substance with alkali showed no significant change in tensile strength or in viscosity, whereas treatment of the fibers with acids, which removed only a small proportion of the pectic substance, produced an appreciable lowering of these two properties. When dewaxed fibers were dispersed in cuprammonium hydroxide solutions, it was found that a small portion remained insoluble. Analysis of the material showed it to consist practically entirely of pectic substance. A consideration of these results led to the conclusion that pectic substance does not contribute to the viscosity of cuprammonium dispersions of cotton. Determinations of the viscosities of cuprammonium solutions to which had been added pectic material from different sources substantiated this conclusion.

PERFORMANCE TESTS OF FLOOR COVERINGS

Building Materials and Structures Report BMS43, released a short time ago, reports the latest performance tests of floor coverings, suitable for low-cost housing projects. It supplements BMS34.

The floor coverings included battleship linoleum, rubber in sheet and tile form, felt-base coverings with various wearing surfaces, three monolithic floors, and a number of asphalt tiles. Lignin pastes, resinous cements, latex adhesives, rubber cements, cut-back asphalt, and asphalt emulsions were used as bonding agents.

Important factors considered are condition of sub-floor as to evenness,

cleanliness, and rigidity; exposure to which the installation is subjected, especially with respect to moisture, concentrated loads, and traffic; durability in relation to cost; and ease or cost of removal and replacement.

Copies of BMS43 are obtainable from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 10 cents each.

EFFECT OF PAINTING ON THE SOUND ABSORPTION OF ACOUSTIC MATERIALS

In the May number of the Journal of Research (RP1298), V. L. Chrisler summarizes the results of some of the Bureau's work on the effect of painting on the sound-absorbing properties of acoustic materials.

It was found that although some of the acoustic materials cannot be painted without a decided loss of efficiency, many can be repainted a number of times, provided the paint is applied in a proper manner.

A discussion is given of the kind of paint which should be used and how it should be applied. Photographs are included to show the surface appearance of different types of material before and after painting.

STRENGTH OF REFRACTORY MORTARS

Air-setting refractory mortars are used to advantage in installations where temperatures are not sufficiently great to cause bonding of firebrick if ground fire clay or high temperature cements are used. Such mortars are marketed either wet or dry. There is some preference for the dry material in freezing climates and in cases where small quantities of mortar are required at periodic intervals and the mortar is mixed as needed.

A study has been completed at the Bureau which included the testing of a fire clay from Ohio and one from Pennsylvania and six proprietary brands of air-setting mortars, with the following results: Beginning with mixtures too stiff for trowelling of the Ohio clay alone, the Ohio clay and grog, and the Ohio clay, grog, and silicate of soda in solution, it was found that the dry strength first increased with the addition of water, then decreased. At maximum strength, however, the mixtures were far too stiff for trowelling purposes. The mix containing the silicate of soda showed considerable increase in strength as length of time of mixing was increased and water content remained unchanged. The Pennsylvania fire clay, which had a dry strength of about 100 lb/in.^{2}, when mixed with 12.5 percent of silicate of soda of the dry type and of a soda-silica ratio of 1:2, developed a strength of about 2,500 lb/in^2. When silicate of soda of a soda-silica ratio of 1:3.2 was substituted, the same increase in strength took place. With this silicate of soda, however, the strength of mixes containing as much as 7.5 percent of the silicate remained low, which was opposite to the effect obtained with the silicate of higher soda-silica ratio. For equal percentages of the silicate, the pyrometric cone equivalents of the mixes containing the silicate of the 1:2 soda-silicate ratio were considerably below those containing the silicate of 1:3.2 soda-silica ratio.

The results of strength tests made after mixing mortars ½, 5, 10, 15, and 20 hours and maintaining the water about constant indicated that air-setting mortars may show the following differences: 1, increase in strength with mixing time up to 5 hours and decrease thereafter; 2, greatest strength after ½ hour, but the decrease thereafter is comparatively slight; and 3, lowest after 2 hours of mixing and greatest strength after 10 hours.

It was noted that the mortars stored in sealed sheet iron drums retained their strength after many months in storage, whereas those stored in burlap sacks lined with moistureproof paper decreased greatly in strength. Such loss in strength was accompanied by the increase of carbonates.

TESTS OF "KNAP CONCRETE WALL UNITS"

Building Materials and Structures Report BMS40 gives results of tests of 12 specimens representing a wall constructed of precast reinforced concrete units, marketed by Knap America, Inc., under the trade name "Knap Concrete Wall Units."

The specimens were subjected to compressive, transverse, concentrated, impact, and racking loads. The deformation and set were measured for uniform increments of load, except for concentrated loads, for which the set only was determined. The results are presented in graphs and in tables.

Copies of BMS40 are now obtainable from the Superintendent of Documents, Government Printing Office, Washington, D. C., price 10 cents.

PERFORMANCE OF "PALISADE HOMES" BUILDING CONSTRUCTIONS

Tests of 30 specimens of wood-plank wall, partition, and floor constructions and of a wood-frame partition construction, patented in the United States and marketed under the trade name "Palisade Homes," are described in the latest Building Materials and Structures Report BMS37.

The specimens were subjected to various loading conditions such as would be encountered in actual service. For each condition three like specimens were tested, thus insuring a fair average. Deformations and permanent sets were measured for uniform increments of load, except for concentrated loads, for which the set only was determined. The results are presented in graphs and in tables, so that values for any condition can be quickly selected.

The report is obtainable from the Superintendent of Documents, Government Printing Office, Washington, D. C., for 10 cents a copy.

REVISED SIMPLIFIED PRACTICE RECOMMENDATION FOR EAVES TROUGH AND CONDUCTOR PIPE

The first revision of Simplified Practice Recommendation R29, Eaves Trough, Conductor Pipe, and Fittings, and Ridge Rolls, became effective December 1, 1939, and is identified as R29–39.

Originally promulgated in 1925, the recommendation established a simplified schedule of sizes for eaves trough, conductor pipe, and elbows, and fixed a minimum gage weight for the metals used in the manufacture of these products, as well as shoes, miters, and all accessories, including gutters, valleys, ridge rolls, etc. It was reaffirmed without change by the standing committee annually from 1925 through 1932, and twice thereafter, in 1935 and 1937.

The current revision eliminates two sizes of eaves trough, adds one size of round conductor pipe, and enlarges the scope of the recommendation to include sizes and styles of plain ridge rolls and box and roof gutters. These changes will result in a reduction in variety of eaves trough, ridge rolls, and their accessories of about 200 items, as well as a substantial reduction in the variety of box and roof gutters, according to the standing committee.

The revised printed issue will include a brief history of the project and will list the members of the standing committee and acceptors of the recommendation.

Printed copies of the revised Recommendation are obtainable from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 10 cents each.

COMMERCIAL STANDARDS FOR SUN GLASS LENSES

Two new Commercial Standards, CS78–39 and CS79–39, now available in printed form, cover respectively ground and polished lenses for sun glasses, and blown, drawn and dropped lenses for sun glasses.

The use of colored glasses for eye protection has increased enormously during the last few years. In quantity production of the lenses, defects may occur that will cause distortion of vision and discomfort to the wearer. The Sun Glass Institute, Inc., therefore, requested the assistance of the Bureau in preparing the present commercial standards, which became effective for new production on October 10, 1939.

Ground-and-polished lenses are manufactured by a process similar to that used in making corrective opthalmic lenses; blown, drawn, and dropped lenses are blown and shaped by means of heat, and are not subjected to grinding and polishing operations.

Commercial Standards CS78–39 and CS79–39, copies of which may be purchased from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 5 cents each, cover the requirements for material and workmanship, maximum light transmission, optical quality, tolerances for prismatic effect and focal power, instruments and methods of testing, and certification of quality of the respective types of sun glass lenses. The pamphlets include a brief history of the projects and a list of firms and organizations that have signified their intention to adopt each commercial standard as their practice in the production, distribution, or use of the commodity. A distinctive label, adopted by manufacturers to certify conformity with the requirements of the commercial standards, and to enable purchasers to identify certified lenses easily, is reproduced in each pamphlet.

NEW AND REVISED PUBLICATIONS ISSUED DURING APRIL 1940

Journal of Research [2]

Journal of Research of the National Bureau of Standards, volume 24, number 4, April 1940 (RP1287 to RP1294, inclusive). Price 30 cents. Annual subscription, 12 issues, $3.50.

Research Papers [2]

[Reprints from the January 1940 Journal of Research]

RP1266. Infrared arc spectrum of germanium. C. C. Kiess. Price 5 cents.

RP1267. Colorimetric determination of arsenic in ferrous and nonferrous alloys. Clement J. Rodden. Price 5 cents.

RP1268. Determination of uronic acids in celulosic materials. Roy L. Whistler, Albert R. Martin, and Milton Harris. Price 5 cents.

RP1269. Thermal expansion of some chromium-vanadium steels. Peter Hidnert. Price 5 cents.

RP1270. Sensitive aneroid diaphragm capsule with no deflection above a selected pressure. W. G. Brombacher, V. H. Goerke, and F. Cordero. Price 5 cents.

RP1271. Physical properties of some purified aliphatic hydrocarbons. Donald B. Brooks, Frank L. Howard, and Hugh C. Crafton, Jr. Price 5 cents.

RP1272. Mathematical theory of irrotational translation waves. Garbis H. Keulegan and George W. Patterson. Price 10 cents.

Handbooks [2]

H25. Screw-thread standards for Federal services 1939. (Supersedes the Reports of the National Screw Thread Commission.) Price 20 cents.

H33. Safety rules for the installation and maintenance of electric utilization equipment. (Comprising Part 3 and the grounding rules of the 5th edition, National Electrical Safety Code.) (Supersedes H7.) Price 15 cents.

Building Materials and Structures Reports [2]

[Persons who wish to be notified of new publications in the Building Materials and Structures series as soon as they are available, should write to the Superintendent of Documents, Government Printing Office, Washington, D. C., asking that their names be placed on the special mailing list maintained by him for this purpose.]

BMS37. Structural properties of "Palisade Homes" constructions for walls, partitions, and floors sponsored by Palisade Home. Herbert L. Whittemore and Ambrose H. Stang with the collaboration of Thomas R. C. Wilson, Forest Products Laboratory. Price 10 cents.

BMS40. Structural properties of a wall construction of "Knap Concrete Wall Units" sponsored by Knap America, Inc. Herbert L. Wittemore, Ambrose H. Stang, and Cyrus C. Fishburn. Price 10 cents.

BMS43. Performance test of floor coverings for use in low-cost housing: Part 2. Percy A. Sigler and Elmer A. Koerner. Price 10 cents.

Simplified Practice Recommendations [2]

R29–39. Eaves trough, conductor pipe, and fittings, and ridge rolls. (Supersedes R29.) Price 5 cents.

R46–39. Tissue paper. (Supersedes R46.) Price 5 cents.

Commercial Standards [2]

CS78–39. Ground and polished lenses for sun glasses. Price 5 cents.

Technical News Bulletin [2]

Technical News Bulletin No. 276, April 1940. Price 5 cents. Annual subscription, 50 cents.

MIMEOGRAPHED MATERIAL

Letter Circulars

[Letter Circulars are prepared to answer specific inquiries addressed to the National Bureau of Standards and are sent only on request to persons having definite need for the information. The Bureau cannot undertake to supply lists or complete sets of Letter Circulars or send copies automatically as issued.]

LC585. Classification of acoustic materials. (Supersedes LC541.)

LC588. The National Association of Hosiery Manufacturers' "NAHM" snag resistance tester.

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[2] Send orders for publications under this heading only to the Superintendent of Documents, Government Printing Office, Washington, D. C. Subscription to Technical News Bulletin, 50 cents per year; Journal of Research, $3.50 per year (to addresses in the United States and its possessions, and in countries extending the franking privilege); other countries, 70 cents and $4.50, respectively.

RECENT BUREAU ARTICLES APPEARING IN OUTSIDE PUBLICATIONS [3]

Hydrocolloidal impression materials: Physical properties and a specification. George C. Paffenbarger. J. Am. Dental Assn. (212 East Superior St., Chicago, Ill.) 27, 373 (March 1940).

Dropping electrode with a constant head of mercury. E. F. Mueller. Ind. Eng. Chem., Analytical Ed. (Mills Bldg., Washington, D. C.) 12, 17 (March 1940).

X-ray diffraction patterns of hevea, manihot, and other rubbers. G. L. Clark, S. T. Gross, and W. H. Smith. Rubber Chemistry and Technology (1500 Greenmount Ave., Baltimore, Md.) 13, 42 (January 1940).

An easily constructed, rugged, sensitive thermopile. H. F. Launer. Rev. Scientific Instruments (175 Fifth Ave., New York, N. Y.) 11, 98 (March 1940).

Retention of aluminum ion and hydrogen ion in papers. H. F. Launer. Paper Trade J. (10 East 39th St., New York, N. Y.) 110, No. 11, 29 (March 7, 1940).

Impact properties of low-nickel steel—A discussion. S. J. Rosenberg. Trans. Am. Soc. Metals (7016 Euclid Ave., Cleveland, Ohio) 28, No. 1, 19 (March 1940).

[3] These publications are not obtainable from the Government. Requests should be sent direct to the publishers.

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